HumanCount

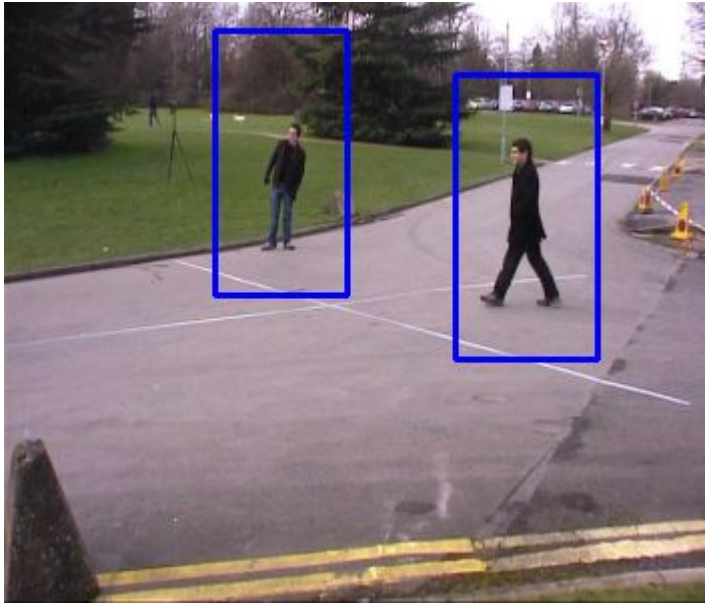
A real-time people counter from a video feed

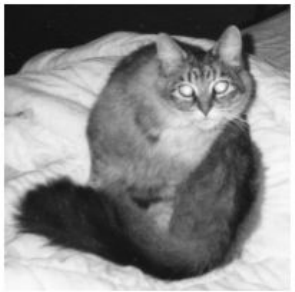
Federico Cernera, Davide Modenese, Davide Quaranta

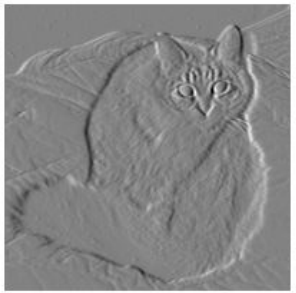
The idea

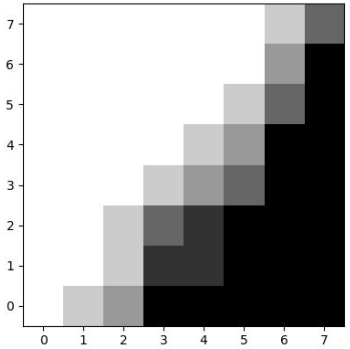
- Real-time **people counting**
- **Known area** to monitor
- **Distance** between people
- Alarms
- Heat-map

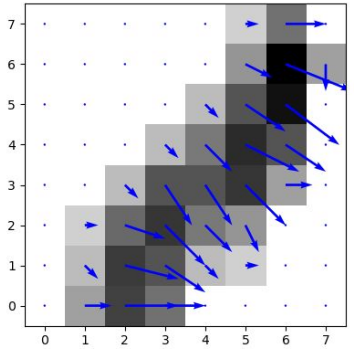
A solution using HOG-SVM



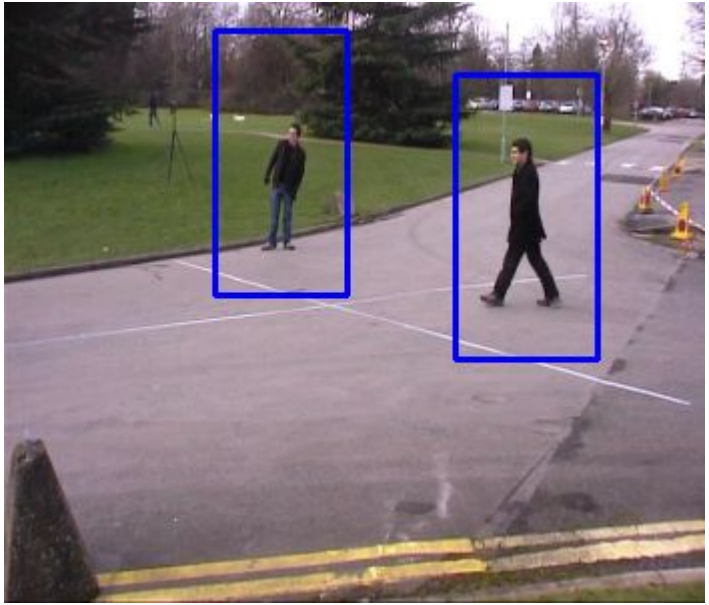






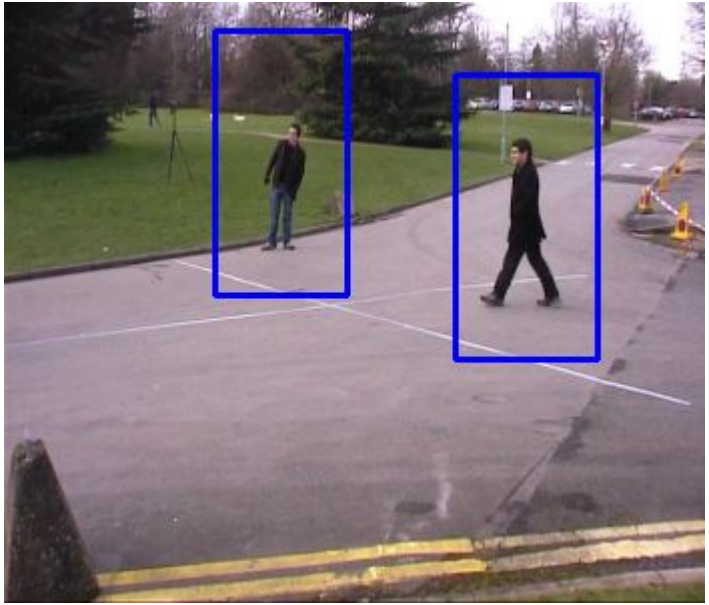


A solution using HOG-SVM: pros



- Suitable for **real-time** requirements.
- Integrated in OpenCV.
- Good results.

The problem

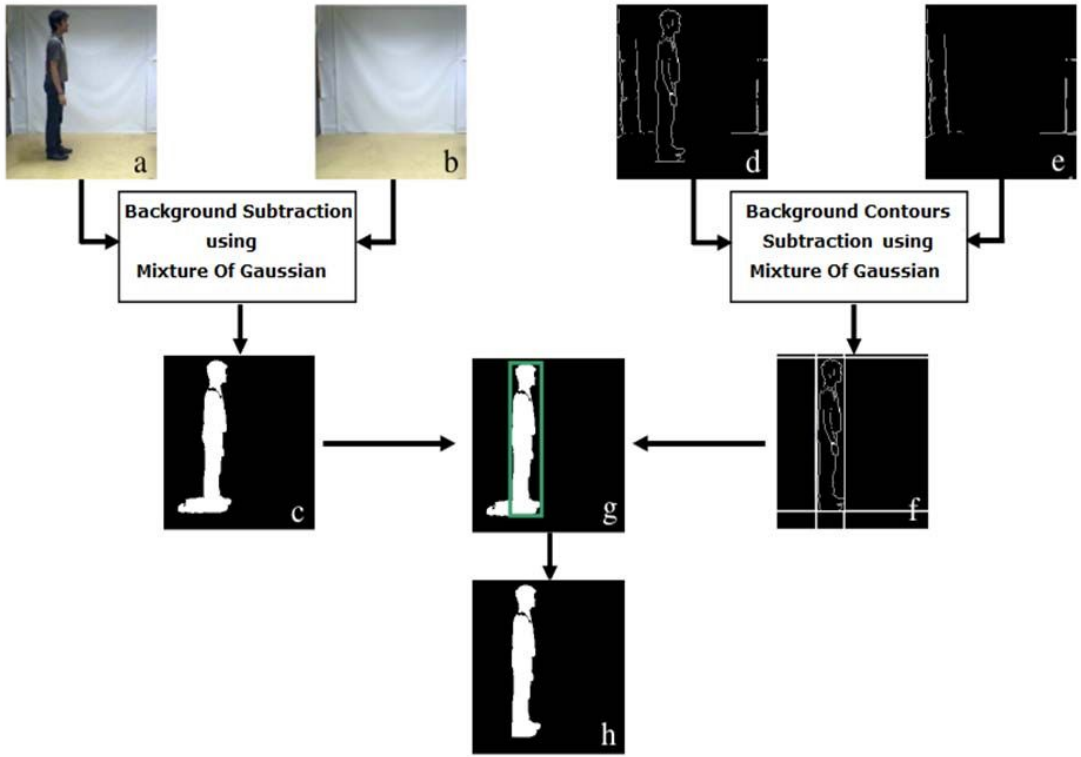


Large bounding box

↓

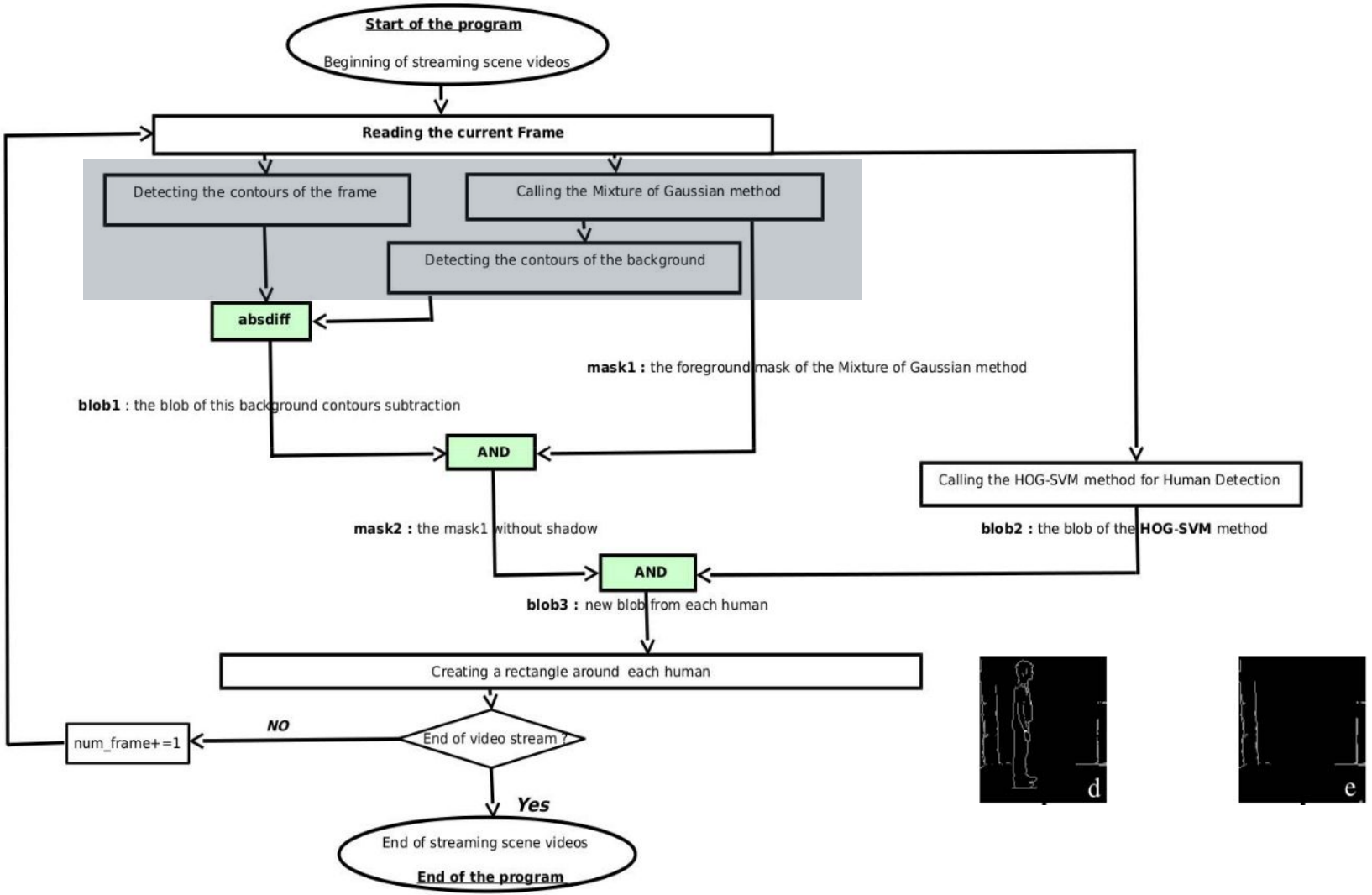
Highly inaccurate distance estimation

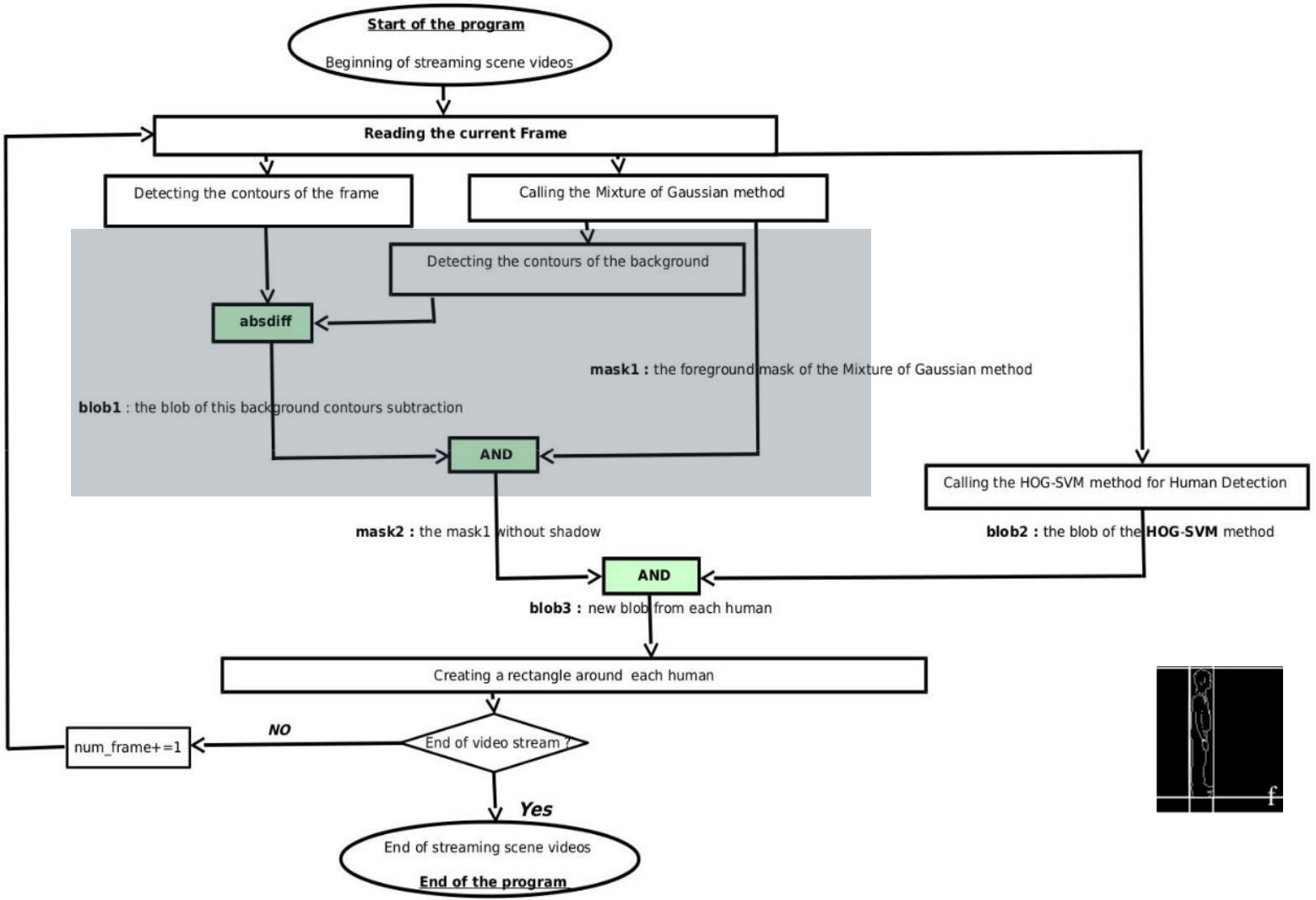
The solution



IEEE computer society

A. H. Ahmed, K. Kpalma and A. O. Guedi, "**Human Detection Using HOG-SVM, Mixture of Gaussian and Background Contours Subtraction**", 2017 13th International Conference on Signal-Image Technology & Internet-Based Systems (SITIS), 2017, pp. 334-338, DOI: 10.1109/SITIS.2017.62.


Start of the program
Beginning of streaming scene videos
Reading the current Frame
Detecting the contours of the frame
Calling the Mixture of Gaussian method
Detecting the contours of the background
absdiff
mask1 : the foreground mask of the Mixture of Gaussian method
blob1 : the blob of this background contours subtraction
AND
Calling the HOG-SVM method for Human Detection
mask2 : the mask1 without shadow
blob2 : the blob of the HOG-SVM method
AND
blob3 : new blob from each human
Creating a rectangle around each human
NO
End of video stream ?
num_frame+=1
Yes
End of streaming scene videos
End of the program
d
e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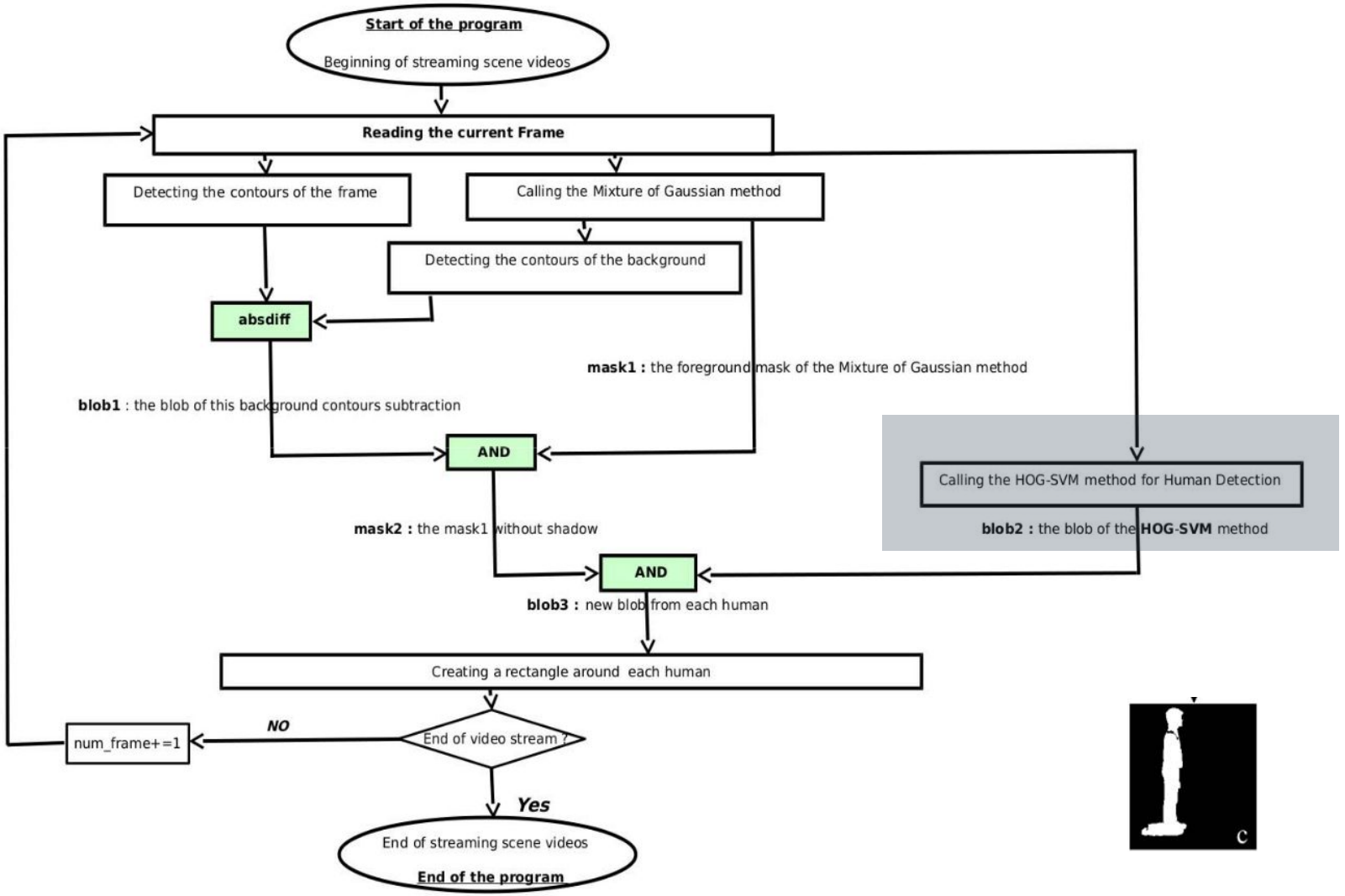
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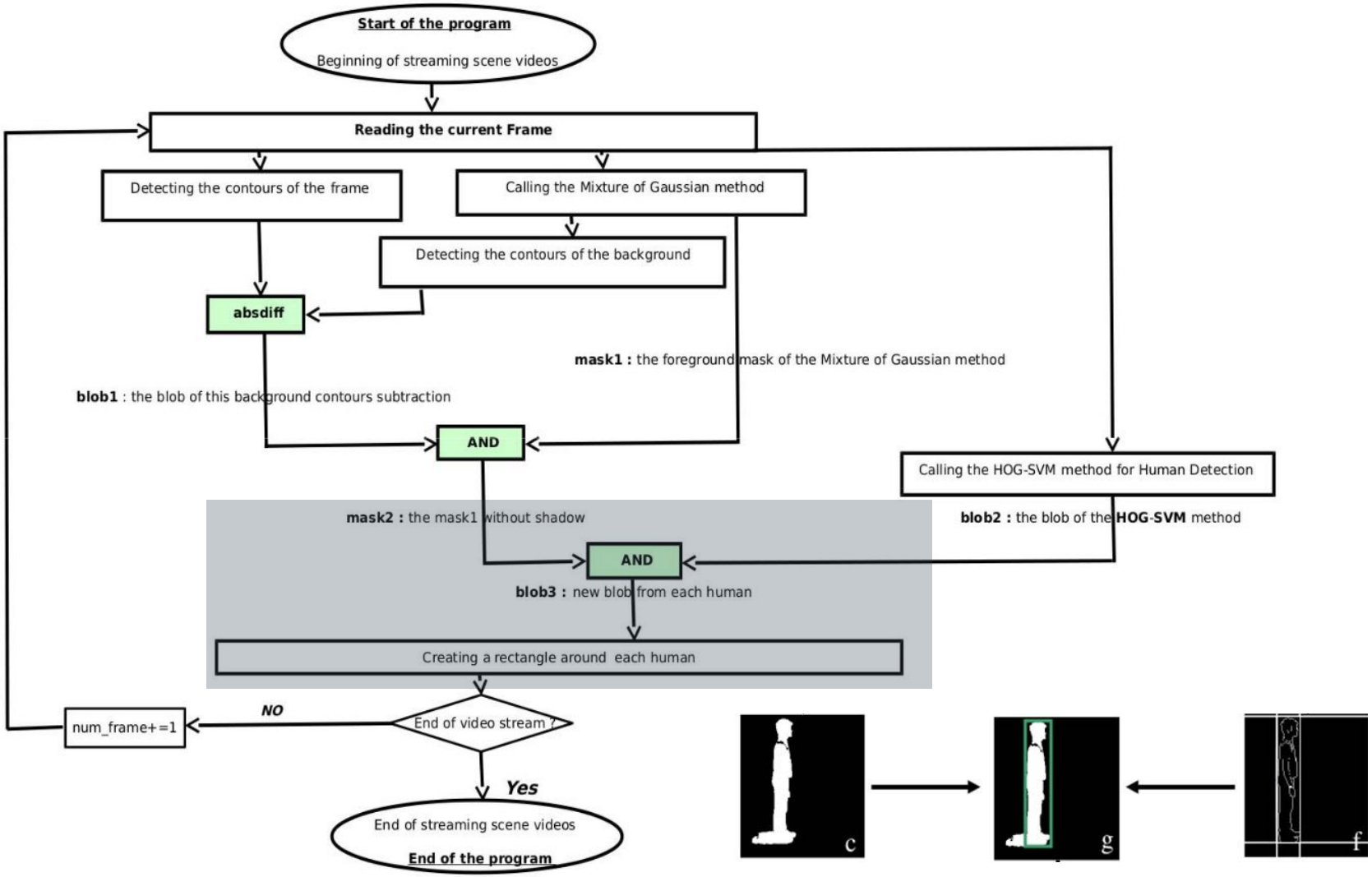
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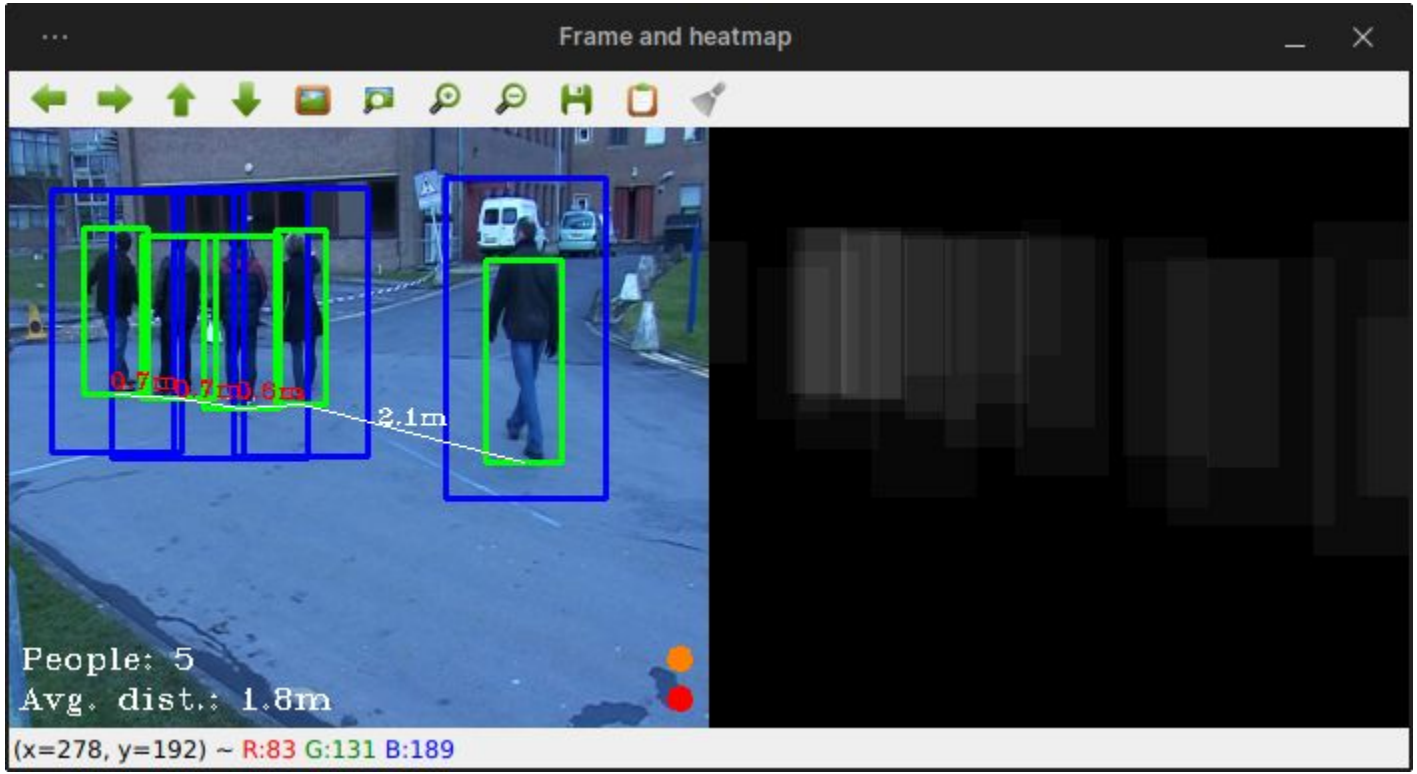
Our implementation



Video configuration

```
{
    "video": "5.mp4",
    "background": "5.png",
    "camera_conf": {
        "height": 2.0,
        "lower_angle": 55,
        "upper_angle": 100
    },
    "alarms": {
        "max_people": 4,
        "min_distance": 1
    }
}
```

What if the background image is unknown?

Extract in **real-time** with MOG2
(paper approach)

heavy
(exec for each frame)

Estimate it **before**
(our addition)

lightweight
(exec only one time)

Addition: **background estimator**

1. Take a video in **input**.
2. **Randomly** select N frames.
3. Compute the “**median frame**” along the given N.
4. **Save** it in a file.

Contours extraction

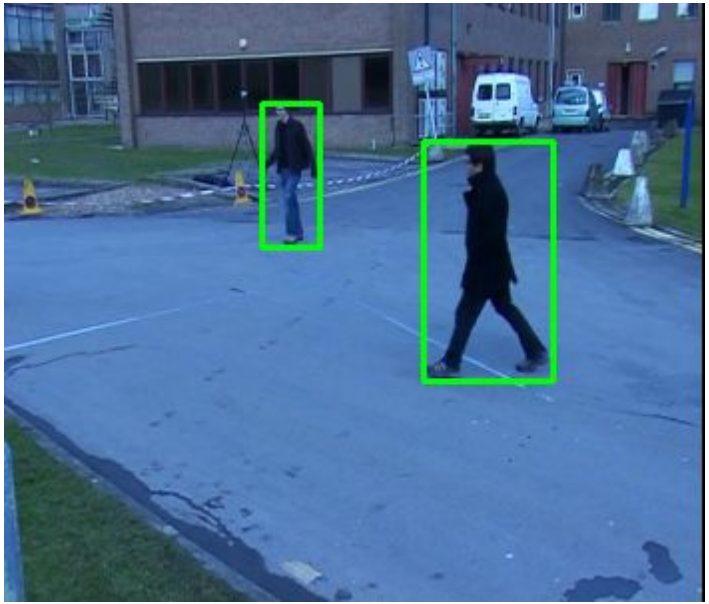
Segmented foreground (absdiff)

Thresholded frame

Foreground contours

HOG boxes

Boxes from contours



Addition: **alarms**


```
"alarms": {
    "max_people": 4,
    "min_distance": 1
}
```

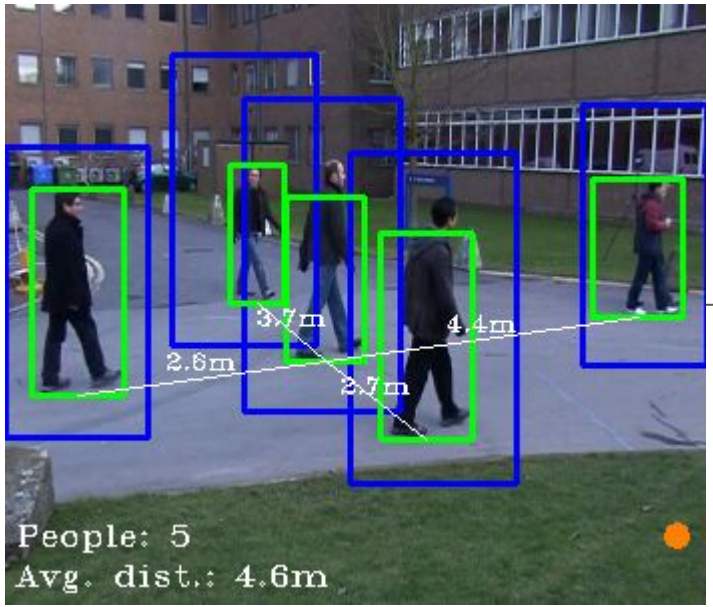
Too close

People count alarm

Distance alarm

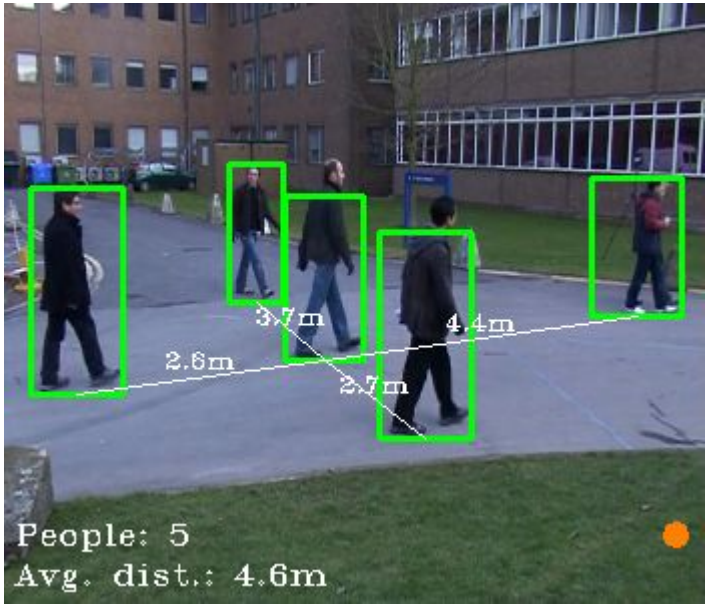
```
[People count alarm] Current: 5;        maximum allowed: 4
[People count alarm] Current: 5;        maximum allowed: 4
[People distance alarm] Found: 0.55;    minimum allowed: 1
[People count alarm] Current: 5;        maximum allowed: 4
```

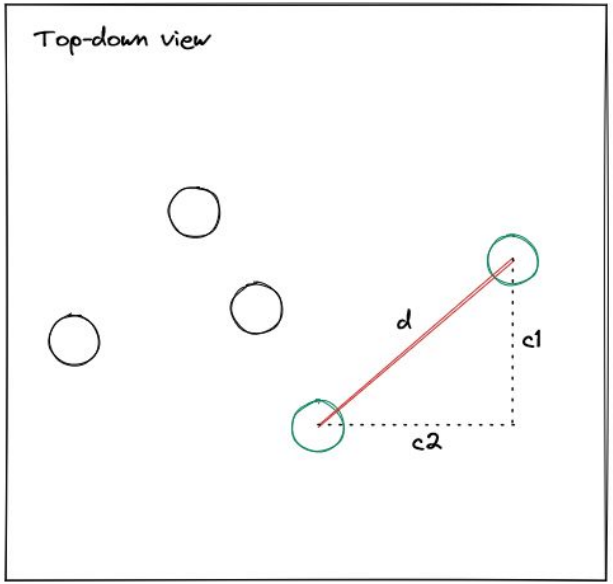
Addition: **number of people**



HOG-boxes count

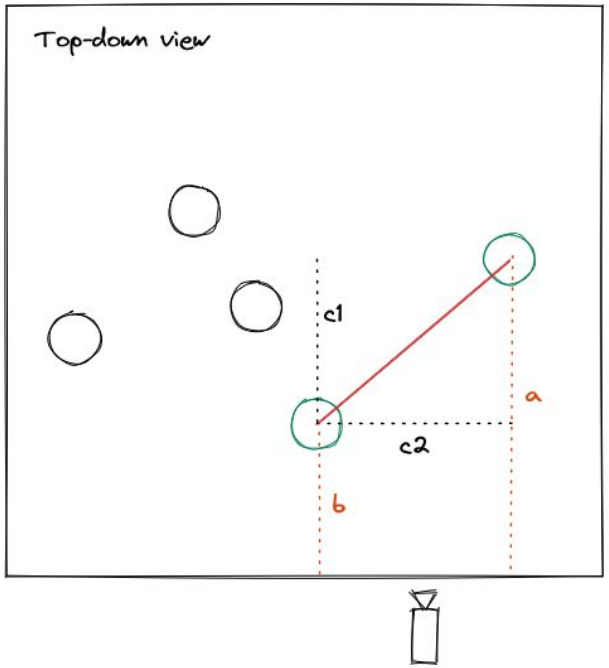
Addition: **people distance estimation**



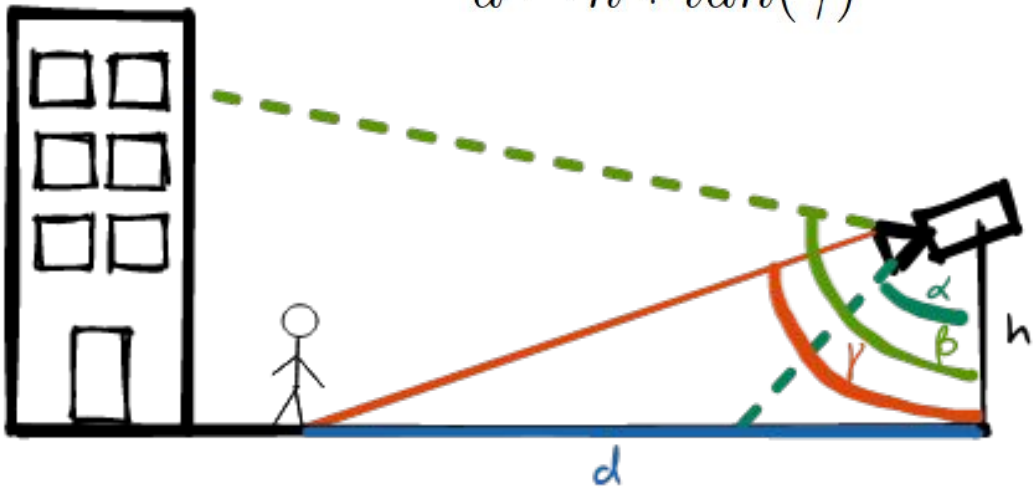


Goal: **Pythagorean theorem**

Addition: **people distance estimation**



$$d = h * tan(\gamma)$$




```
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    "height": 2.0,
    "lower_angle": 55,
    "upper_angle": 100
},
```
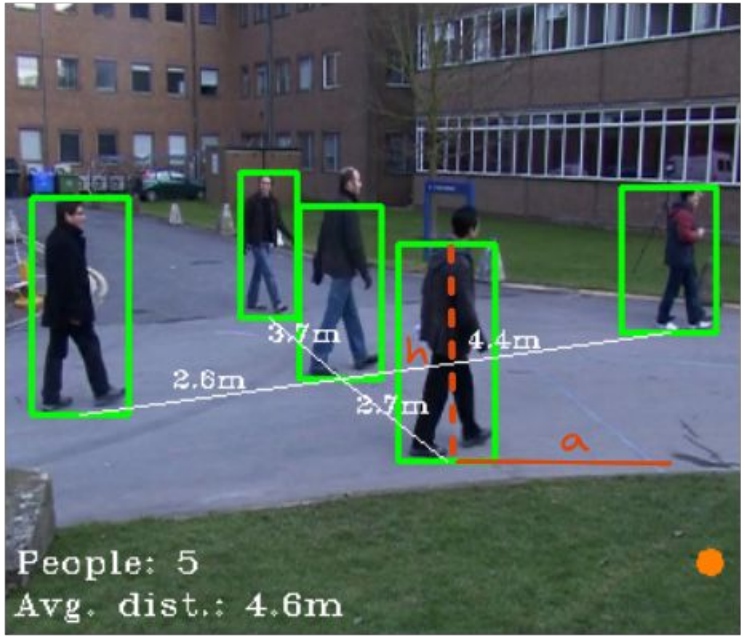
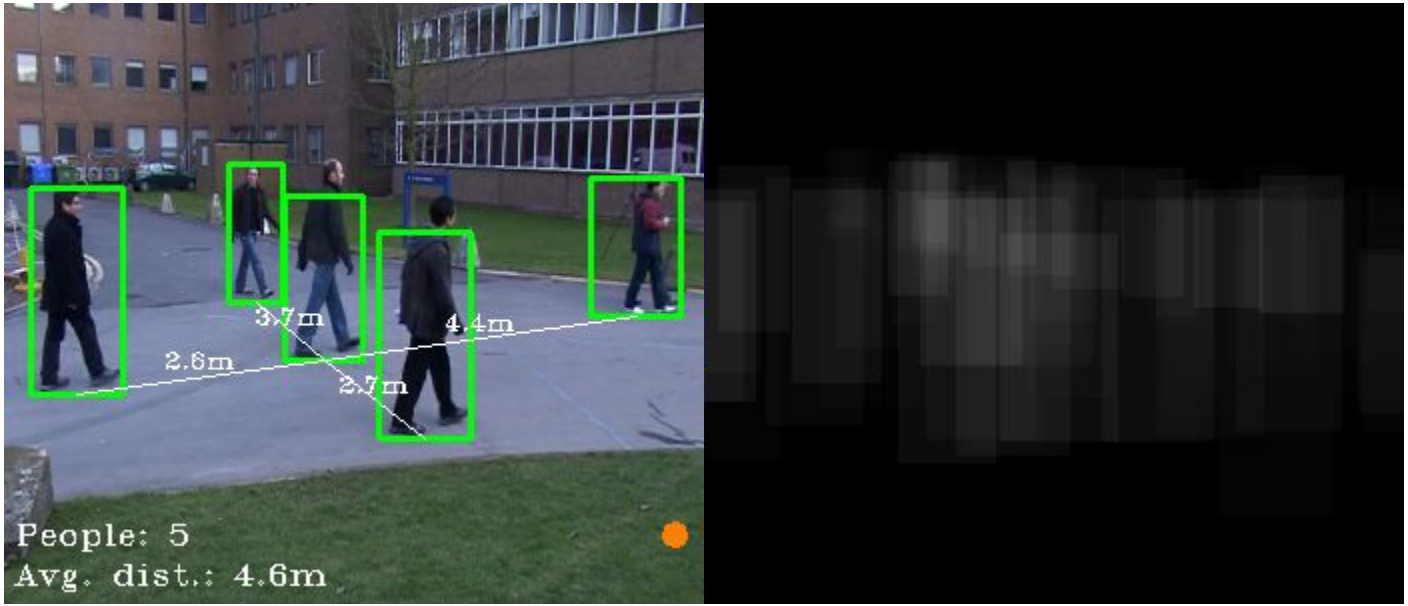

Addition: **people distance estimation**



- Fixed height assumption.
- Compute px difference on x axis.
- Convert it to meters.

Addition: **heat-map**



Recap

- Real-time **people counting**
- **HOG-SVM** approach
- Paper to improve HOG bounding boxes
- **Additions** to the paper:
  - People counting
  - Distance between people
  - Alarms
  - Heat-map
  - Background estimation